CHAPTER I
INTRODUCTION

A. Background to The Research

Based on geological position, Indonesia has many mountainous area, slope and hills. Because of that, mountainous area, slope and hills often used as resident, resort, hotels, and of course the highway as infrastructure. However many soil condition and slopes is unstable, especially when we added the existing high rainfall, then the possibility of occurrence of the landslide will be higher. Therefore, there should be a reinforcement on the slope conditions as a way to overcome the problem of landslides, and one way is to install soil nailing as retrofitting slopes. Another thing to consider in the design of soil nailing is Internal Stability Analysis, namely soil nailing reinforcement must be able to withstand the loads that are working (tensile load and shear load), and then that is External Stability Analysis to ensure the required length of soil nailing able to withstand global stability.

To speed up the calculation and to minimize errors when designing soil nailing, it needed presence of assistive program. The assistive program that we use is Geo5. Geo5 is a program created to solve various geotechnical problems. This program is not only able to design and calculate soil nailing but also to calculate and design foundation, soil stability, settlement analysis, excavation design and many more. How to work of this program is, by drawing slope that will be installed soil nailing, then input the material data that used as the type of steel and type of concrete. After that input loads that work, then this program will analyze the safety of soil nailing that designed.

B. Statement of The Research

Based on the background of the problems described above, the statement of the research as below:

1. Need to conduct a research on internal stability analysis and external stability analysis of soil nail wall.

2. Finding the value of the safety factor for soil nail wall using Geo5 program.

C. The Research Objective

The objective of this research is as below:

1. Designing and calculating the dimensional of soil nail wall.
2. Find the value of safety factor of soil nail wall using Geo5 program.
3. Comparing the result of safety factor between manual method and Geo 5 program

D. Benefit of The Research

The benefit of designing soil nailing using geo5 program is as below:

1. General benefit, provide knowledge of new program in geotechnical field, particularly civil engineering students of Universitas Muhammadiyah Surakarta, namely Geo5 program. And providing an alternative design dimension and stability of soil nail wall be more accurate, fast and effective.
2. Determine the extent of using Geo5 program for design soil nail wall, so the program can be used and applied in the field.
3. Helping to solve landslides problem in Indonesia.

E. Limitation of The Research

Given the many issues related to the design of soil nailing, then this plan is given problem limitation which aims to limit the discussion from spreading and limitations become apparent. Boundary problem used in this research are as below:

1. This research is done in Piyungan road – the border from Gunung Kidul.
2. The design is only done until temporary facing in construction sequence of soil nailing.

3. The dimension and amount of nail bar are adjusted to the need in the field.
4. In manual calculation concrete cover and grout is ignored to simplify the calculation.
5. Ground water table not calculated.
6. Control stability of nailed slope against external stability (global stability, sliding, bearing capacity) and internal stability (nail pull-out failure and nail tensile failure)
7. Soil data from test result Direct Shear Test (DST), can be seen in the table below.

Table I.1. Test Result DST

Type	Bor Hole I (BH I)		Bor Hole II (BH 2)	
	Depth 2.50 – 3.00 m	Depth 5.50 – 6.00 m	Depth 2.50 – 3.00 m	Depth 5.50 – 6.00 m
Unit Weight of Soil ( )	1,548 gr/cm^3	-	1,895 gr/cm^3	1,876 gr/cm^3
Specific Gravity (Gs)	2,66	-	2,67	2,66
Cohesion (c)	0,163 kg/cm^2	-	0,242 gr/cm^2	0,216 gr/cm^2
Friction Angle ( )	30,44^0	-	20,29^0	24,61^0
Average Water Content ( )	44,82 %	-	46,52 %	37,80 %

(Source: soil mechanic laboratory Universitas Sebelas Maret, Ahsin, 9 January 2007)

F. The Originality of Research

There are several research similar to this research, however have similarities and differences with this research. Similarities and differences in this research by similar studies are as follows:

Table I.2. Similarities and Differences with Similar Research

No	Title	Researcher	The Purpose	Scope of Problem
1	Design gravity wall by using Geo5	Gutama Rymo	1. Design the dimensions and stability of the gravity wall against the dangers of the overthrow and collapse shift with manual methods. Then design by using Geo5 program. 2. The using geo5 Program for find safety value from the stability of gravitation wall	1. the data taken to design this wall is taken from the project for Mandiri bank in solo 2. in this research it uses retaining wall for gravitational soil

2	Design masonry wall using Geo5 Program	Arya nugraha from Muhamadiyah Surakarta Universities	1. Design the dimensions and stability of the gravity wall against the dangers of the overthrow and collapse shift with manual methods. Then design by using Geo5 program. 2. The using geo5 to look for the safety value from the stability of gravitation wall	1. this design is done in Piyungan road the border from Gunung Kidul 2. in this research it uses soil retaining wall type concrete reinforcement by using reinforcement concrete cantilever wall) Which uses the structure from steel.
3	Design abutment by using Geo5 Program	Abdulrahman Yasin from Muhamadiyah Surakarta Universities	1. Design the dimensions and stability of the gravity wall against the dangers of the overthrow and collapse shift with manual methods. Then design by using Geo5 program. 2. The using geo5 Program for find safety value from the stability of gravitation wall	1. this design is done in Piyungan road the border from Gunung Kidul 2. in this research it uses soil retaining wall type concrete reinforcement by using reinforcement concrete cantilever wall) Which uses the structure from steel.
4	Soil Nailing Design By Using Geo5 Program	Sri Ardiyati Kusuma Wardani	1. Design the dimensions and stability of the soil nailing against the dangers of the overthrow and collapse shift with manual methods. Then design by using Geo5 program. 2. The using geo5 Program for find safety value from the stability of gravitation wall	1. this design is done in Piyungan road the border from Gunung Kidul 2. in this research it uses soil nailing for reinforcement of the slope, structure of soil nailing is from steel.

This research is focused on designing soil nailing for sloping area, but both using the same program namely Geo5 program to solving the problem and reanalyzed with manual methods to determine the strength of soil nailing reinforcement. This research done with data taken from Piyungan road- the border from Gunung Kidul. So, this final project entitled “Soil Nailing Design by using Geo5 Program”.